Systematic Review Of Effect Of Hydrotherapy In Relation To The DASS Scale As A Measurement Of Rheumatoid Arthritis Outcome

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Abstract:

Background:

Rheumatoid arthritis is a long standing illness for which a less invasive and easy therapy is not explored across the globe. Drugs have short term benefits and prevention of deterioration is essential in this case. Hence hydrotherapy and its effect on RA with DAS scale as a tool for measuring outcome needs to be considered for better assessment of the patient’s condition.

Material and Methods:

A systematic search of past 10 year literature was carried out across PubMed, Scopus and Google Scholar search engines. The key search was related to RA, Hydrotherapy and DAS scale. A total of 21 papers under each section was selected after initial search. Only original work related to the therapy were selected. No risk of bias assessment was done.

Results:

No correlation with pathological changes were observed across any of the studies. No extrapolation is possible through the results obtained from these studies, due to small sample size and no long term follow ups.

Conclusion:

Though the studies report of a positive outcome; more robust data is required to apply hydrotherapy as a mechanism of regimen in RA cases. The DAS scale is a valid tool to assess the outcome post intervention.

Keywords: Hydrotherapy, Rheumatoid Arthritis, DAS scale.

Introduction

Rheumatoid Arthritis (RA) is defined as a chronic, inflammatory, autoimmune systemic disease with exacerbation and remission.¹ According to the World Health Organization, its prevalence is between 0.3 to 1%.² The onset of RA is most common in the fourth and fifth decades of life.³ This condition is mainly genetic in development; the majority of people carry the HLA-DRB1 04 cluster epitope.⁴⁵ Environment factors such as smoking and infection increase the rate of progress and severity of the disease. A host of mononuclear cells such as T cells, B cells, mast cells and macrophages are locally activated at the site of the synovial joint. The lining of the joint becomes hyperplastic, expands and forms villi.⁶ Consequences of the activation of effector cells by cytokines.

(a) Effect on T cells. The inset depicts the mechanism of action of abatacept, which inhibits T-cell co-stimulation.
The pannus, which is the osteoclast rich part of the membrane, destroys the bone. The inflammatory cells secrete enzymes which degrades the cartilage. The joint affected by RA shows increased inflammation and cellular activity. From the Naturopathy point of view, RA is a result of generalized inflammation; which when left unattended worsens both mental as well as physical state of an individual. It begins the slow degradation process, and ultimately major changes related to the skeletal system are seen in the patients. As it matures, there is tendon tethering, erosion of the surface of the joint and impaired movement. The range of deformity depends on the type of joint that is affected. The clinical features of RA are pain, swelling, tenderness and morning stiffness that are symmetrical in nature and involve small joints of the hands and feet. Other large peripheral joints, such as knee joints and elbow joints, may also be affected as the disease progresses.

There are extra-articular manifestations in the form of nodules, vasculitis, pericarditis, rheumatoid lung, uveitis and keratoconjunctivitis sicca. Other common features of RA are fever, fatigue, weight loss, limited functional ability, depression and poor self-esteem. This leads to decrease in the range of movement, functional limitation, loss of independence, reduction of quality of life (QoL). Treatment algorithms involve use of biological, conventional as well as disease-modifying drugs. Non-pharmacological therapy includes different types of therapy such as rest, exercise treatment, electrical stimulation and occupational therapy. Exercise programmes have been suggested to be the cornerstone of rehabilitation for RA as they improve function, muscle strength and general well-being mainly administered via hydrotherapy. Rehabilitation professionals generally define hydrotherapy as heated-pool exercise therapy specifically designed for an individual in an attempt to improve neuromuscular and musculoskeletal function. It is due to the hydrodynamics principles that immersion in water has biological effects that are recommended for medical applications. The physical properties of water that have the potential of physiological changes are relative water density, hydrostatic pressure, buoyancy (resilience) and thermodynamics. Although hydrotherapy has a well-established background, still enough evidence is not present.

The current systematic review aims to evaluate two important aspects:

1) The effectiveness of hydrotherapy as a disease management tool for patients with RA and
2) Reliability and Validity of Disease Activity Score (DAS) as an outcome measure in patients with RA to evaluate any changes with respect to the pathophysiological effects so that appropriate intervention can be availed by them.

Objective

To evaluate the effectiveness of hydrotherapy for managing RA patients and DAS as an outcome measure to assess the severity of disease and measure outcome.

Eligibility criteria:
The present assignment analyses the effectiveness of hydrotherapy. To obtain more systematic search outcomes, the use of Boolean operators, truncation, and wildcards were made. To effectively navigate the search outcomes, PICO criteria were utilised in this study. The below table suggests the framework in the PICO criteria:
Table 1: PICO criteria for the included studies.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Interventions</th>
<th>Comparison</th>
<th>Outcome</th>
<th>Study design</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 to 80 years of age (No restriction was applied on gender)</td>
<td>Hydrotherapy</td>
<td>NA</td>
<td>Reduction in pain intensity, Emotional well-being and physical well-being</td>
<td>Critical review</td>
<td>Clinic, hospital</td>
</tr>
</tbody>
</table>

Search strategy:
This study utilised the recognised search engines such as in PubMed, SCOPUS, and Google Scholar databases to identify the relevant evidence on hydrotherapy. In the launched search, Search criteria were set from 2000-2020; however, the emphasis was given to papers in the last 10 years. The identified research papers were selected on the basis of their inclusion criteria and the use of techniques such as hydrotherapy. Only original studies were included in the review. No specific limitations were imposed on cohort classification, study cohort, setting or country. The comprehensive search resulted in a total of 9 studies. Evaluation of hydrotherapy as an effective RA patient management tool and analysis (reliability and validity) of DAS as an outcome measure was conducted as listed in the table below (Table 02).

<table>
<thead>
<tr>
<th>Database</th>
<th>Hits</th>
<th>Relevant papers</th>
<th>Keywords</th>
<th>Search limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scopus</td>
<td>526781</td>
<td>2</td>
<td>Hydrotherapy, Rheumatoid arthritis “AND” DAS, Rheumatoid arthritis “AND” QoL (Quality of life)</td>
<td></td>
</tr>
<tr>
<td>Google Scholar</td>
<td>60070</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 02: Studies relevant to the search engines included in the review

Results
Critical evaluation of hydrotherapy in RA:
Hydrotherapy performed actively in warm water assists in rehabilitation and recovery. It is a popular treatment for those with musculoskeletal conditions; it mainly aims at the relaxation of muscles, reduces pain and improves the joint motion. Physiotherapists are involved with this type of rehabilitation settings wherein client satisfaction, and adherence to this exercise has been
found to be high.\textsuperscript{15} Bilberg et al (2005) reported a study on the effect of moderately intensive exercise therapy in the pools on RA patients. They randomly allotted 46 patients to two groups-one receiving exercise in pool for 12 weeks (20 patients), another served as a control group of 23 patients. They measured the aerobic capacity using a submaximum bicycle test and the SF-36 questionnaire as primary outcome measures. The muscle endurance tests- Chair test and shoulder endurance test were performed, one for the lower and one for the upper extremity in each of the participant after the intervention. At the end of their study, they did not find any significant difference with respect to improvement in the aerobic capacity or the physical functioning. The overall DAS 28 scale score was also reported to be the same for both groups after the intervention. All components of SF 36 in the treatment group showed a significant positive improvement from baseline to 6 months when compared to the controls. Muscle endurance (isometric shoulder endurance, grip force, dynamic endurance of lower extremities using chair test and muscle function of lower extremities) was significantly higher in the treatment group. This difference was maintained for a period of 3 months post the therapy.\textsuperscript{16} This study had a number of shortcomings as follows-

1. Patients with different RA stages/ levels were grouped as one.
2. The sample size was small, and convenience sampling was done for patient recruitment
3. Data generalization is not a possibility.
4. There is always a risk of non-treatment effects like responders bias in the qualitative part of the results. Even though they said that SF 36 showed an improvement, they failed to report the daily routine and work profile of the patients, which is affected in RA patients.
5. Did not acknowledge any actual changes in the pathophysiological aspects of RA like swelling, or elevation of specific immune mediators, cytokines etc.

Eversden et al. (2007) carried out a single-blind randomized trial on 115 patients with RA. The participants were divided into two groups based on the intervention received for a period of 6 weeks (land exercise and hydrotherapy). The primary outcome as self-reported effect of treatment measured on a rating scale of 1 to 7 (with 1 being very much worse and 7 being very much better). The secondary outcomes measured were, pain, assessed on a 10 cm visual analogue scale (VAS), physical function assessed with the health assessment questionnaire (HAQ); ten metre walk speed, and a EuroQol-5D (EQ-5D) valuation questionnaire comprising a self-report of health related quality of life (EQ-VAS) and a health status valuation (EQ-5D index or utility score). The authors reported that patients treated with hydrotherapy (87\%) reported that they were much better or very much better than those treated with land exercise (47.5\%) when compared to the baseline data. Even though the hydrotherapy group showed improvement in the 10 meter walking capacity and lesser pain, the difference between the two groups was not found to be significant. At the end of the study, no change was reported as compared to the baseline in both intergroup and intragroup comparison.\textsuperscript{17} The drawbacks of this study were-

1. Outcome measures were self-reported (pain), can lead to social desirability bias.
2. The study compared subjective outcomes in the form of a rating scale, thus the data cannot be generalized.
3. It is difficult to gauge a drastic improvement in QoL measures under such circumstances since the disease is a long-standing one.
4. An actual pathophysiological correlation in terms of swelling of joint, restricted movement or any other systemic condition in a real-life scenario- like after working in the office or at home was not specified.
5. It is unclear whether it is the bone loss that is reduced, the role of cytokines that is altered or any other alternative mechanism which is induced by this therapy.

6. Also, one cannot say that this therapy will be more effective in long-standing cases once the therapy stops after a brief period.

7. The authors also mentioned that hydrotherapy was not cost-effective to the institution. Siqueira et al. (2017) reported their randomized controlled trial results among 133 female patients who were known cases of RA. They compared hydrotherapy with land-based exercises over a period of 16 weeks. The intervention was for 3 times/week. They examined muscle strength and the disease activity using DAS 28 scale. The evaluation was done at baseline, at 8 weeks and 16 weeks. There was no significant change in the muscle strength of the knees. But the improvement was seen with the DAS scores at 8 weeks and 16 weeks. The study fell short in-

1. Correlating the results with any pathological changes related to the joints.
2. No blood components were examined during or at the end of the study. Hence the actual effect cannot be gauged on RA by this therapy.
3. No parameter related to the actual pathophysiology of RA and the therapy was carried out like enzymes, interleukins, rate of bone loss etc.
4. This study involved only women, not men. As age progresses, the hormonal activity can cause greater bone loss in women (like in menopause). There is paucity of literature related to the cumulative effects of menopause and RA on bone loss and other aspects of RA pathophysiology. Hence the effect of such conditions along with RA in women needs to be reported more, which will assist in a more specific treatment plan for such groups. Mateen et al. (2017) made an effort to analyse the effect of hydrotherapy on the oxidative stress in RA among 40 patients who were compared with age and sex-matched healthy controls. For the study, 40 RA patients: n=20 received hydrotherapy with conventional drugs and n=20 received only conventional drugs for 12 weeks. DAS28 and antioxidant status were analysed in the treatment groups. The level of 25-hydroxy vitamin D decreased in RA patients at the end of the study. Reactive oxygen species and inflammatory cytokines were found to be elevated in RA patients in comparison with the healthy controls. The rise was more pronounced in seropositive patients and those with severe RA. Inflammatory cytokines showed a negative correlation with 25-hydroxy vitamin D and positive correlation with ROS. These parameters had not changed significantly with the use of conventional drugs. But, drug therapy showed a decrease in the oxidation of DNA, lipid, and protein through an increase in the antioxidant enzyme activity. The study concluded that hydrotherapy with conventional drugs was effective in ameliorating oxidative stress levels. This is one of the recent studies to highlight the cumulative effect at the molecular level in RA patients. The higher level of pro-inflammatory cytokines found in patients having a DAS score of > 3.2 shows that inflammatory cytokines, along with ROS, are involved in increasing the severity of RA. The presence of rheumatoid factors can exacerbate the severity of the disease since a higher cytokine level is seen in patients who are positive for the rheumatoid factor. The authors, however, have not mentioned the time duration and the follow-up period of the patients. No vitamin D and ROS correlation with the pro- and anti-inflammatory cytokines was carried out in the study. Thus any polymorphism related to the cytokine gene or exaggerated activity of rheumatoid factors can be used as a target for seeing the actual effect of hydrotherapy.
Outcome measures of RA:
In order to consider the intervention of hydrotherapy as successful, there is no golden rule or thumb rule established as the best one except for testing the actual cellular level pathophysiology, which may not always be feasible. X rays may show the presence of deterioration only after a marked bone loss. So one has to depend on certain physical parameters to ensure that the therapy is being received positively like- the number of swollen joints, a measure of pain, discomfort, disability, health status mentioned by the patient, observation of the patient's health condition by the physician, organ failure and death. These can serve as the markers for measuring the outcome of RA therapy. The inflammatory rheumatic diseases are associated with many disorders and symptoms; hence, the quantification of these outcomes is also dependent on the nature of the disorder. The major struggle in drawing a conclusion for the best single outcome measuring is the difficulty in understanding the intricate pathogenic pathways of the RA.\textsuperscript{20}

The Disease Activity Score (DAS) or DAS 28 scale is based on the activity of the disease in RA. The core values are the total count of swollen joints, weak joints, erythrocyte sedimentation rate and the patient's global assessment rating. It is an indication of the RA activity and the expected trend over a period of time. It is suggested that the DAS score be frequently calculated until it is reached a particular remission level of ESR (erythrocyte Sedimentation Rate) or CRP (C-Reactive Protein). Initially, it was for 44 joints, but now it is used for 28 joints (hence DAS 28). It always needs a blood sample to be co-related with the joint counts on the scale. The response given by the patient helps to evaluate the efficacy of the treatment being provided (Table 03).\textsuperscript{21}

<table>
<thead>
<tr>
<th>Improvement in DAS28 score</th>
<th>&gt;1.2</th>
<th>0.6–1.2</th>
<th>≤0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current DAS28 score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤3.2</td>
<td>Good</td>
<td>Moderate</td>
<td>None</td>
</tr>
<tr>
<td>3.2–5.1</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
</tr>
<tr>
<td>&gt;5.1</td>
<td>Moderate</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 03 : Efficacy scoring as per DASS criteria

The validity of the DAS scale:
Undoubtedly, it is imperative to establish the validity, reliability, accuracy and responsiveness of such outcome measures. It makes the tool standardized to be applied uniformly across a particular region or state. Hence the quality of assessment is not affected, and the level of treatment provided also remains the same. Thus DAS can serve as a pre and post comparison scale to see if there is a marked improvement.\textsuperscript{21} The different types of validity related to DAS scale- criterion, concurrent, construct, content, predictive validity of the scale is discussed in table 04.
Table 04: Validity of the DAS scale:

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Type of validity</th>
<th>Author(s)</th>
<th>Year of study</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Criterion- It measures the extent to which the measure is related to the outcome</td>
<td>McWilliams et al.(^{22})</td>
<td>2018</td>
<td>“The potential of derived indices as measures of non-inflammatory mechanisms in people with apparently active RA (DAS28-ESR ≥ 3.2). The tender-swollen difference, DAS28-P and tender: swollen ratio is surrogate indices of non-inflammatory pain mechanisms. DAS28-ESR remains a valuable measure of active synovitis, which continues to facilitate the development of disease-modifying treatments and helps target treatments those to those who gain the most benefit. Derived indices, such as tender-swollen difference, conveniently assist interpretation of DAS28-ESR as a measure of inflammatory disease activity.”</td>
</tr>
<tr>
<td>2.</td>
<td>Concurrent- How a new test is as good as an established gold standard</td>
<td>Salaffi et al.(^{23})</td>
<td>2009</td>
<td>“the DAS28 and CDAI (Clinical Disease Activity Index) were well correlated with HAQ (Health Assessment Quality) (both at p level of &lt;0.0001). The discriminatory power of both indices was good without a significant difference.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Das et al.(^{24})</td>
<td>2017</td>
<td>“There was strong agreement between DAS 28 and RAPID 3 severity categories (kappa = 0.959, P &lt; 0.0001)”</td>
</tr>
<tr>
<td>3.</td>
<td>Construct- Degree to which it measures the intended change accurately</td>
<td>Carpenter et al.(^{25})</td>
<td>2016</td>
<td>Meta-analysis article concluded that- “High levels of acute phase markers, baseline radiographic damage, anti-CCP and RF positivity remain consistently predictive of long-term radiographic joint damage.”</td>
</tr>
<tr>
<td>4.</td>
<td>Content- all items on the scale cover the entire domain of the disease condition.</td>
<td>Radovits et al.(^{26})</td>
<td>2008</td>
<td>“A high DAS28 was found to perform equally in all age groups, in men and women, despite the elevating effect of age on ESR. In elderly men with low disease activity, remission rate could be underestimated by an elevated ESR. If the DAS28 score was &gt;3.2, age and gender did not have a significant effect on any components”</td>
</tr>
</tbody>
</table>
5. Predictive—How well the scores are predicted for a given disease condition

Seror et al. 2010 “The DAS and DAS28 do not correlate strongly with joint damage at a single point in time. There is a significant correlation between the DAS28 and radiographic progression (P < 0.0001) of bone loss.”

Reliability of DAS:
Siemons et al (2014) reported that the DAS28- ESR and CRP are both reliable tools for accessing disease activity in early RA cases. They reported overall reliabilities of 0.85 and 0.86, respectively for both the scales (The values for reliability coefficients range from 0 to 1.0. A coefficient of 0 means no reliability and 1.0 mean perfect reliability). 28 Since all tests have some error, reliability coefficients never reach 1.0. Generally, if the reliability of a standardized test is above 0.80, it is said to have very good reliability; if it is below .50, it would not be considered a very reliable test. So in both studies, the reliability determined by Chronbach’s alpha (Intra rater) was 0.8, which meant that the scale was accurate enough to reproduce the same acceptable range of results in same patients under similar circumstances. Table 05 shows the types of reliability studies carried out in relation to DAS28 scale.

Table 05: Types of Reliability in relation to the DAS 28 scale

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Type of reliability</th>
<th>Author</th>
<th>Year</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Test- retest/ or intra rater-</td>
<td>Fransen and van Riel 2009</td>
<td>2009</td>
<td>Test-retest reliability for the DAS was 0.89 (it was highly accurate).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uhlig, Kevin and Pincus 2009</td>
<td>2009</td>
<td>Test–retest reliability for the DAS was 0.85 (it was highly accurate).</td>
</tr>
<tr>
<td>2.</td>
<td>Reproducibility: Ability to produce the same results under repeated measurements</td>
<td>McWilliams et al. 2018</td>
<td>2018</td>
<td>Disease duration does not influence the outcome of the test.</td>
</tr>
</tbody>
</table>
Welsing et al (2004) carried out a study to investigate the longitudinal relationship between inflammatory disease activity and subsequent radiologic progression. A comparative cohort of 185 cases (original DAS scale) and 152 cases (DAS 28) were assessed every 3 months for disease activity and every 3 years for radiologic damage. A positive longitudinal relationship was indicated between the mean interval of the original DAS and DAS 28 and radiologic progression. In both the cohorts, “the longitudinal relationships between (fluctuations in) disease activity and radiologic progression were found”. This was selective in RF positive patients. The study concluded that “fluctuations in disease activity are directly related to changes in radiologic progression, and this relationship might only exist in RF-positive patients”.30 This study was the first of its kind, since it followed patients over a span of 9 long years, had no drop outs and also co related x-ray findings with that of the signs and symptoms reported by the patients. Thus DAS (either original or modified) is sensitive to identify any fluctuations in the disease activity.

Another study in Italy investigated the relationship between the disease activity and radiographic progression of the joint damage in 48 early RA (ERA) patients (< 1 year of RA diagnosis). They were observed every 3 months for the disease activity using DAS 28 and radiological joint assessment of the knee joint was done. IgM-RF was assessed at the end of the study. At the baseline all the patients were controlled for disease activity using drug therapy and biological agents. Baseline assessment of bone loss was also carried out. After 3-years of follow-up, radiographic progression was observed in 54.2 % of the total patients. Time-integrated values of DAS28-CRP had the highest positive predictive value for progression (p<0.0001). This study indicated that the level of disease activity assessed by bone erosion of joint radiographically was positively co related to the measurement of DAS28 and IgM- RF.32 The study had some drawbacks-

1. Use of convenience sampling and small sample size
2. No gender wise comparison of the population.
3. All patients were allowed to use NSAIDs. So the effect of NSAIDs was not considered in the study.
4. Generalization of the study results cannot be done.

But the study did prove that DAS is a valid scale to measure the outcome in RA cases. In all cases, it is necessary that the DAS scale is supported with blood investigations (RF factor) as well as radiographs. It can’t serve as a stand-alone criteria for the disease activity.

Discussion

This literature analysis establishes that hydrotherapy provides more successful short-term outcomes.16–18 Rehabilitative experts should be encouraged to explore the possibility of prescribing hydrotherapy for patients with RA. Communication between such experts who deal with chronic issues related to the musculoskeletal system and general practitioners should increase the awareness of the benefits of hydrotherapy. An increased awareness might allow physicians to target patients who might benefit from treatment. It is important for all RA patients to be given the opportunity to receive hydrotherapy. However, careful considerations should be made for the evaluation of the symptoms. Moreover; the literature search provided us with only one direct article satisfying all the three parameters in our analysis- RA, hydrotherapy and DAS score. Individual studies do show some improvement in terms of physical parameters like muscle strength after hydrotherapy. But it is definitely more effective than land exercise as seen from the studies discussed above. Also, improvement in the muscle function is also seen within 6 weeks.
of intervention. This, along with medications, has an additional effect as per Mateen et al. (2017) in terms of affecting the pathophysiology of the entire disease process, it is shown to have reduced the oxidative stress levels and enzyme-mediated destruction of the synovial membrane and the adjacent bone. As of now, the improvement in the physical components of physical movement like muscle strength and ability to walk better after hydrotherapy as reported by Eversden et al. (2007) and Siqueira et al. (2017) shows that the therapy is effective, but the exact step and site at which the therapy works at the molecular basis are unclear.

It is evident from the literature above that there were a number of limitations present in the studies which ranged from no randomisation, no blinding, no long term follow-ups, a small number of test groups etc. Also, some studies failed to provide comprehensive statistical data. The studies also differed in therapy dosage (duration, intensity and frequency of hydrotherapy) provided; which again makes it difficult to decide the precise regimen. Moreover, RA is a chronic disease and intervention has to be long term, which calls for the cost-effectiveness of the therapy; which still needs to be devised. Plus, some of the therapies included a range of drugs along with hydrotherapy to exhibit observable benefits, which again questions its effectiveness when administered alone. It can be devised from all the shortcomings that extensive research with larger population size, blinding; both patient and assessor along with use for validated and reliable outcome measures is required, keeping in mind the psychological state of the patient. Though trials related to drug interventions are many, which focus on the pathophysiology of RA, exercise therapy trials are required to understand the precise role in the process. Presently, it is only known that hydrotherapy is effective in the short term. It is not feasible to provide hydrotherapy ad infinitum, and other alternatives to hydrotherapy in the hospital must be considered once maximum improvement has been made. Patients should be provided with enough information, based on current research, for them to understand the benefits of hydrotherapy and to make an informed choice when offered it or consider giving it up. Future studies should consider investigating the cost-effectiveness of hydrotherapy and the best aquatic exercise for RA patients in the longer term.

It is not clear whether the short-term effects of hydrotherapy have long-term impacts on costs to the provider, the patient or society. Hydrotherapy interventions consist of multiple factors to be considered during their applications. But there are no definitive guidelines for the same. Like the optimal temperature, depth of water, intensity, duration and frequency of the therapy are still not clear. So one cannot say that hydrotherapy will definitely work in RA. But there is no direct evidence as to which aspect of the entire pathway of RA aetiology does hydrotherapy directly affect. It is still unclear whether it stops the immune cells, improves the synovial membrane life, prevents easy bone breakdown at the joints or helps to slow down the further degradation. Hence there is a scope for more in-depth research and also, more importantly, sharing of the data for the benefit of other practitioners. After studying relevant research work on the application of hydrotherapy as a RA management tool: no conclusive statement establishing it as only the go-to therapy can be made.

### Conclusion

More robust studies are needed to co-relate blood related and changes in and around the joints. This will assist to clearly understand the actual pathway where hydrotherapy exerts its exact effect. More focus can be on those areas while treating the patients. Extensive and qualitative randomized controlled trials with the large population; inclusion of sexes, different age group and severity of the disease is needed. To measure the severity of the RA, there is no established
"gold standard" outcome measure. Here, the reliability and validity of DAS were evaluated. DAS, after a thorough review of the literature, was found to be effective; it was both valid as well as reliable. Therefore, the use of DAS by the experts is recommendable. This always needs to be supported with detailed clinical assessment, radiological evaluation and blood findings (CRP).

References:


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